Original Article

Promoting Oral Health Behaviors of Adolescent Girls Using a Health Belief Model

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Abstract

Background: With a focus on people's beliefs, a health belief model (HBM) attempts to define and promote the health performances of different population groups. The current study aimed to determine the effect of education, based on the HBM, on promoting the oral health behaviors of adolescent girls in Shahrekord.
Methods: This interventional study was conducted on female students in junior high schools in Shahrekord during the educational year 2018-2019. Using the cluster sampling method, a total of 80 adolescent girls were selected from public schools in Shahrekord and randomly divided into experimental and control groups. The required data were collected using a researcher-made questionnaire before, immediately after, and two months after the intervention. In addition, a standard checklist was employed to evaluate the station of oral health. The training was provided to the members of the experimental group in seven sessions, each lasting 50-60 minutes. Using SPSS 21, the data were analyzed via paired t test, independent t test, and repeated measures analysis of variance (ANOVA).
Results: After the intervention, the mean scores of perceived sensitivity, perceived severity, perceived benefit, perceived barriers, and perceived self-efficacy in the experimental group increased significantly (f=61.12, $P<0.001$). Moreover, the mean scores of oral health behaviors in the experimental group significantly increased two months after training ($P<0.001$).
Conclusion: Training based on the HBM had an important role in creating a favorable attitude and thus practicing oral health behaviors in students.
Keywords: Oral health, Educational Intervention, Health belief model, Adolescent

Introduction

Paying attention to oral health at a young age not only positively affects the beauty of people but also has a highly important role in reducing oral diseases. According to the World Health Organization, observing oral health behaviors is essential for every individual and is an important part of public health throughout life. It is also believed that poor oral health has a major impact on the quality of life (1). Tooth decay threatens all age and gender groups in the world (2).

Most oral diseases progress after the onset and do not improve on their own. To examine, diagnose, and treat these diseases, it is necessary to make long and continuous efforts, spend high amounts of money, and recruit skilled and capable personnel; on the other hand, neglecting timely treatment leads to tooth loss (3). Tooth decay and gum diseases are among the most common health problems worldwide, and severe gum and tooth disease lead to tooth loss in 5-15% of the population (4). Oral health can affect children's performance during school age and have a negative impact on their future. Million school hours are lost each year as a result of oral health difficulties (5). It is estimated that oral diseases affect approximately 3.5 billion persons in the world. Universally, it is estimated that 2.3 billion persons and more than 530 million children and adolescents suffer from tooth caries (6). Dental caries and periodontal diseases usually start from childhood, and practicing good oral health behaviors during this period has a great impact on reducing a variety of diseases (1,7). Taking into consideration the important role of teeth in various behaviors such as chewing, speech, normal facial growth, and physical beauty, it is of great importance to prevent tooth decay, gum disease, and tooth loss (8). To make effective improvements in oral health related behaviors in individuals, it is essential to deeply understand their decisions about using toothbrushes (9).

One of the basic strategies to improve the level of oral health in every community is to design and implement

effective and preventive training programs based on health education and health promotion principles using effective educational models and theories (10). The health belief model (HBM) is one of the important theories in this field.

According to the HBM, a person adopts preventive health behavior only when he/she believes that they are at serious risk of oral diseases (perceived sensitivity) and that the disease will lead to serious complications and consequences for them (perceived severity); in this condition, they think that they can prevent the disease or minimize the related complications and problems (perceived benefits) by performing certain behaviors; however, there are physical, psychological, or financial barriers to performing these behaviors (perceived barriers). On the other hand, one must believe that he/she is capable of performing preventative behaviors (11). Nowadays, self-efficacy is extensively used in health and well-being subjects; for instance, investigations have indicated that self-efficacy is related to the capability to tolerate experimental pain (12). At the same time, self-efficacy is a significant predictor of the health performance of brushing (13). Assuming the importance of oral health and the need to pay attention to the health of adolescent girls, the current study sought to determine the effect of HBM-based education on promoting the oral health performance of adolescent girls in Shahrekord in 2018-2019.

Materials and Methods
Study Design
This interventional study was performed as an intervention on 80 female students in junior high schools during the educational year 2018-2019. Considering a confidence interval of 95% and a test power of 80%, the sample size in each of the experimental and control groups was calculated to be 40 people. According to the inclusion criteria, the study was conducted on female high school students whose addresses and telephone numbers were collected for follow-ups; in addition, after coordination with parents, a written and informed consent form was obtained from the students. On the other hand, the exclusion criteria were students' unwillingness to participate in the study in any of the stages of research and their absence (two sessions), transfer to another school, or illness.

The samples were collected by the cluster sampling technique so that the investigator referred to the teaching association of Chaharmahal and Bakhtiari province. After obtaining approval from the officials and receiving a letter of introduction, the researcher referred to the two educational zones of Shahrekord and received the list of female high school students in both zones. Two public female high schools were randomly selected taking into account the desired number of samples and the population of first-grade high school students in every school.

After referring to the selected schools, the investigator communicated with the school leaders about the topic of the intervention and its goals, and the necessary coordination was made with them and the teachers who were selected to complete the questionnaires and hold educational interventions in their class hours. The students in the target group were provided with adequate explanations about the study subject and its objectives, as well as the method of holding training sessions and how to complete the questionnaires. Further, a written consent form was obtained from them. Only after obtaining consent, without any obligation, the students were requested to collaborate with the investigator and comprehensive the questionnaire with the greatest care. The selected adolescent girls were randomly assigned to experimental and control groups.

Measurements
The researcher-made questionnaire, the validity and reliability of which had been confirmed, was equally presented to both groups. The questionnaire had 4 sections on demographic variables (6 items), awareness (5 items), constructs of HBM, including perceived sensitivity (6 items), perceived severity (5 items), perceived benefits of performing oral health related behaviors (10 items), perceived barriers to performing oral health behaviors (14 items), self-efficacy to perform oral health behaviors (5 items), and behavior (4 items).

Examples of items related to perceived sensitivity and perceived severity included *"I have a high risk of tooth decay"* and *"If I get a tooth decay, I have to pay a lot for the restoration"*, respectively. Those of the perceived benefits of performing oral health related behaviors, perceived barriers to performing oral health behaviors, and self-efficacy to perform oral health behaviors were *"Regular brushing prevents tooth decay"*, *"Regular brushing is not easy for me"*, and *"I can brush properly twice a day"*, respectively. A five-point Likert-type scale was used to examine all constructs, ranging from strongly disagree (0), disagree (1), no opinion (2), agree (3), and strongly agree (4). Items on perceived barriers were scored reversely. To score the items on the awareness, every correct answer was scored one point, and every wrong and "no opinion" answer was scored zero. A checklist with 6 items was also applied to assess students' performance. To score the items on the performance, Yes and No answers were scored one and zero, respectively. The score range for all constructs and performance was from 0 to 100 points.

To assessment the face validity of the form, a complete list of items was provided to a group of 30 female students with characteristics similar to the target population. The aim of this stage of the research was to determine the impact score index of each item of the data collection tool in a sample of people similar to the target group. To this end, in front of each of the items of the tool, five options were set, including "completely important, important, moderately important, slightly important, not important at all", and scores ranging from 1 to 5 were assigned to each of the five mentioned options, respectively.

After calculating the impact score index, substances with a calculated score of more than 1.5 were certain as suitable substances and retained for the next steps. At this phase, the items were assessed from the point of view of the target group in terms of the level of difficulty, the grade of relevance, and ambiguity (the possibility of misunderstanding words or inadequacies of word meanings). In this study, the students' opinions were applied to improve the tool. To check the content validity, the questionnaire was provided to five specialists in the field of health education and promotion. After applying the experts' opinions on the items, the content validity of the questionnaire was assessed in terms of content validity rate (CVR) and content validity index (CVI). Moreover, experts were consulted to calculate the CVR regarding the necessity or non-necessity of each item. CVR values higher than 0.56 were accepted considering the Lawshe table (14). To determine the CVI, the factors of relevance, clarity, and simplicity of each item were observed, and values higher than 0.79 were accepted accordingly (15). Cronbach's alpha values obtained for each of the above-mentioned constructs were 0.71 (awareness), 0.76 (perceived sensitivity), 0.8 (perceived severity), 0.82 (perceived benefits), 0.65 (perceived barriers), and 0.75 (perceived self-efficacy).

Intervention

Interventions designed based on the constructs of the HBM were performed for the experimental group in seven sessions, each lasting 50-60 minutes once a week using slides and speeches, pamphlets, group discussions, images, and short video methods.

In the first session, the researcher got familiar with the students and established an intimate and friendly relationship with them, and stated the goals of the sessions. Then, a number of slides were used to introduce and explain oral health, types of teeth, dental functions, a brief description of dental surfaces and the functions of each dental surface, dental caries, and causes of dental caries and their symptoms. Slides and speeches presented in the sessions were the main tools of the researcher for training; however, the researcher prepared a summary of training in a pamphlet and provided them to the students.

In the second session, after presenting content on perceived sensitivity, first, the contents of the previous session were reviewed, and using slides, tooth decay was introduced as an important factor in causing discomfort and many other diseases. By applying the available statistics, it was emphasized that oral diseases are not only adult diseases, but can affect people of any age, and if this issue is ignored, the person will suffer from tooth decay and gum problems. It was noted that if they have a family history of tooth decay and gum disease, they will be more likely to develop the disease. Moreover, in a group discussion, students expressed their views on being at higher risk of developing dental caries and gum disease in girls and women. The group discussion was managed in such a way that students would come to the conclusion that women and girls may develop oral diseases for many reasons such as neglecting a proper diet and pregnancy. Students' misconceptions were corrected by using slides, especially the group discussion. It should be noted that during the group discussion and student talk, one of them talked about her 14-year-old sister's extensive dental caries. Although at the beginning of the session, most students reported dental caries and gum disease as a problem more common in the elderly and adults, at the end of the session, they became sensitive to this important issue, which seemed to leave no room for doubt among students.

In the third session concerning perceived severity, more emphasis was placed on the complications, consequences, and problems that will result from oral disease. Using images and short videos related to dental caries, enough emphasis was put on gum disease, tooth loss, deformity of the smile and appearance of affected persons, inability to speak properly, digestive problems, and negative effects and consequences of poor oral health. During the group discussion, some students demonstrated their doubts about the inability to do things and the costs associated with oral diseases, most of whom were those who had no case of the disease around them. However, one of the students talked about a family experience and her mother's disability and severe pain in her teeth. Another student mentioned problems caused by the disease and the high costs spent to treat and repair teeth.

In the fourth session presenting perceived benefits, using slides and educational videos and following the group discussion, students were taught that maintaining good oral health will improve their health, reduce bad breath, and regular brushing and flossing will prevent tooth decay. As a result, it will help to be less worried about tooth decay. Regular brushing will make people feel refreshed and have more energy, and in the case of regular use of toothbrushes and flossing, people smile more beautifully, make more friends, and thus prevent many costs associated with treating oral diseases.

Brain-storming, along with group discussion was used in the fifth session focusing on perceived barriers to performing behaviors related to oral health. To increase the motivation of students to participate in the discussion, their comments were written on the whiteboard. The group assessing method was employed to select the person who was supposed to write down the students' opinions; the students were asked: who would you vote for if you were to choose a representative from among yourself? In this way, the person was selected based on students' opinions and votes, and thus their motivation to participate in the discussion was doubled. One by one, we presented the existing barriers to oral health from the perspective of adolescent girls. The opinions of all students were carefully written on the whiteboard by the selected representative. We did not edit what the students said while keeping in mind that comments should not be criticized. No one

was allowed to criticize or blame. During this time, all suggestions were accepted and noted, and strange or exaggerated opinions were welcomed because creativity was considered a key to success. More suggestions were provided in line with the mentioned suggestions. Next, the list of suggestions was shortened, and the main and important points were extracted based on the students' opinions. It was ensured that everyone participated in the discussion. Finally, the suggestions were prioritized and a decision was made with the students to start performances associated with oral health.

In the sixth session on presenting perceived self-efficacy, students were taught some points to increase their self-efficacy using slides, pamphlets, and group discussions; it was indicated that there is no need to change behavior all at once and in a short time, for example, brush their teeth regularly and use mouthwash or floss regularly three times a day. It was suggested that they patiently and in small steps achieve the desired oral health behaviors.

In the case of performing behaviors correctly, it was suggested that they will give themselves a small reward and encourage themselves to have a more beautiful smile by mentioning statements such as "You are more attractive and better from now on".

Pupils were requested to draw a table on a piece of paper and mark down the barriers to each behavior in one column and the facilitators of each behavior on the other side of the column. Then, every barrier was reviewed one by one, and the best strategies to neutralize the barriers were written down accordingly.

We asked adolescent girls to recognize and choose suitable patterns for good oral health performances; for instance, they were requested to recall a person who always brushes and flosses frequently, and therefore, he or she is always healthy and fresh, without teeth problems, toothache, and other dental problems.

In the seventh session concerning oral health behaviors, adolescent girls were asked to bring a toothbrush with them on a certain day. At the beginning of the session, the correct way to brush and floss teeth was explained using the prepared educational videos. After watching the educational videos and reviewing the material by the instructor and getting feedback on important points about how to brush and floss, the scholars were requested to practice the correct way of brushing using their toothbrushes. They also used dental floss provided by the researcher to learn how to properly separate the floss, place the floss between the fingers, and pull it properly between the tooth surfaces. When the behavior was performed correctly, the adolescent girls were given positive feedback, and the positive points of their behavior were emphasized, and when they had problems or forgot a part in any of the stages of the practice, the instruction on that behavior was explained again and repeated practically. Then, they were requested to repeat the performance once more.

Directly after the sessions for the experimental collection, the data was collected again from both the experimental and control groups using the questionnaire, and two months later, the follow-up was performed by applying a similar form. After the completion of the project, two training sessions were held for the students of the experimental group, and the contents were explained to them.

Statistical Analysis

After collecting information from the adolescents and entering the data into SPSS (version 21), the tests of normality distribution were conducted by the Kolmogorov-Smirnova test. The final analysis was performed by descriptive and analytical tests, including independent t-test, paired t-test, and repeated measures analysis of variance (ANOVA). Differences were considered statistically significant at $P < 0.05$.

Results

This study was conducted on 80 girl high school students in Shahrekord in 2018-2019. In the current study, the age of the students was 13-15 years. Overall, 26% of fathers had a high school diploma, and 35% of mothers of adolescent girls were educated up to junior high school. In addition, 60% of the fathers of the students were self-employed and 90% of mothers were housewives. There was no statistical difference between the two groups in terms of demographic variables ($P < 0.05$, Table 1).

Based on the results of repeated measures ANOVA, the mean scores of perceived sensitivity, perceived severity, perceived benefit, perceived barriers, and perceived self-efficacy in the experimental group were significantly different before, immediately after, and two months after the intervention ($P < 0.001$), but the difference was not significant in the control group ($P < 0.05$). The mean score in each of the studied times was higher than the pre-intervention stage, but based on the two-way time test in the experimental group, the mean scores of all the constructs of HBM increased immediately after the intervention as compared with the time before the intervention. However, the mean scores decreased two months after the intervention in comparison to immediately after the intervention ($P < 0.001$). The effect of interaction between the time and group was also significant. It can be stated that the difference in the mean scores of the model structures at different times varies according to the variable levels of the group (Table 2).

The results of the paired t-test revealed that the mean scores of oral health behaviors in the experimental group were significantly different before and two months after the intervention ($P < 0.001$), but this difference was not significant for the control group at different times ($P < 0.05$). Based on the results of the independent t-test, before the intervention, no significant difference was found between the experimental and control groups in terms of oral health behaviors ($P = 0.644$), while two months after the intervention, the difference between the mean scores was significantly different in the two groups ($P < 0.001$, Table 3).

Table 1. Demographic Characteristics of the Study Groups

Demographic Characteristic	Grouping	Experimental Group	Control Group	P Value
		No. (%)	No. (%)	
Father's age (y)	30-39	17(42.5)	14 (35)	
	40-50	21 (52.5)	23 (57.5)	0.561
	>50	2 (5.0)	3 (7.5)	
Mother's age (y)	<30	4 (10.0)	5 (12.5)	
	30-40	30 (75.0)	25 (62.5)	0.652
	>40	6 (15.0)	10 (25.0)	
Father's occupation	Worker	10 (25)	6 (15.0)	
	Self-employed	24 (60)	24 (60)	
	Employee	4 (10)	10 (25)	0.336
	Other	2 (5)	0	
Mother's occupation	Housewife	37 (92.5)	36 (90.0)	0.413
	Employee	3 (7.5)	4 (10)	
Father's education	Illiterate	9 (22.5)	11 (27.5)	
	Primary school	15 (37.5)	5 (12.5)	
	Junior high school	9 (22.5)	11 (27.5)	0.235
	Diploma	7 (17.5)	13 (32.5)	
Mother's education	Illiterate	1 (2.5)	2(5)	
	Primary school	11 (27.5)	11 (27.5)	
	Junior high school	13 (32.5)	15 (37.5)	0.528
	Diploma	15 (37.5)	12 (30)	

Table 2. The Comparison of the Means of HBM Constructs Before, Immediately After, and Two Months After the Intervention in the Two Groups

Variable	Groups	Before the Intervention	Immediately After the Intervention	Two Months After the Intervention	P Value Time	P Value Time*Group
		Mean (SD)	Mean (SD)	Mean (SD		
Awareness	Experimental group	35.55 (2.57)	77.60 (2.43)	75.32 (2.87)	0.001	0.001
	Control group	34.76 (2.62)	36.53 (3.10)	36.20 (3.12)	0.068	
	P value	0.976	0.001	0.001		
Perceived sensitivity	Experimental group	32.30 (1.79)	73.54 (1.16)	72.60 (1.25)	0.001	0.001
	Control group	32.25 (1.94)	34.42 (2.35)	32.96 (2.28)	0.372	
	P value	0.938	0.001	0.001		
Perceived severely	Experimental group	35.05 (2.23)	75.19 (1.49)	74.06 (2.08)	0.001	0.001
	Control group	34.89 (2.30)	37.27 (2.35)	34.76 (2.35)	0.100	
	P value	0.901	0.001	0.001		
Perceived benefits	Experimental group	42.79 (2.27)	81.88 (0.89)	80.56 (1.21)	0.001	0.001
	Control group	43.68 (2.28)	46.23 (1.93)	45.32 (1.78)	0.118	
	P value	0.924	0.001	0.001		
Perceived barriers	Experimental group	40.13 (1.91)	72.93 (1.12)	71.67 (1.19)	0.001	0.001
	Control group	39.61 (2.07)	41.31 (1.87)	41.27 (1.88)	0.099	
	P value	0.916	0.001	0.001		
Perceived self-efficacy	Experimental group	35.33 (1.95)	55.43 (2.94)	54.30 (2.01)	0.001	0.001
	Control group	35.42 (1.95)	38.14 (2.06)	35.47 (1.90)	0.956	
	P value	0.742	0.001	0.001		

Note. HBM: Health belief model; SD: Standard deviation.

Table 3. The Comparison of Behaviors in the Two Groups Before and After the Intervention

	Before the Intervention	Two Months After the Intervention	P Value
	Mean (SD)	Mean (SD)	
Experimental group	46.32 (1.98)	67.30 (2.11)	0.001
Control group	45.65 (1.94)	46.42 (1.93)	0.932
P value	0.644	0.001	

Discussion

The purpose of the current study was to improve the oral health behaviors of adolescent girls in Shahrekord using the constructs of HBM. Oral health is one of the most significant twigs of public health and is important to human well-being. On the other hand, the overall health of the body depends on oral health (16).

Health training is one of the most important and basic measures to prevent oral diseases and thus improve the health of the community. The utilization of appropriate educational strategies to raise awareness and thus change the beliefs and perceptions of people is one of the most efficient and cost-effective measures to prevent diseases and health problems (17).

In the present study, the level of awareness of female students about oral health related behaviors at the beginning of the study was low in both groups, which could be due to insufficient training provided by both schools and families. Nonetheless, after the intervention, the mean score of awareness in the experimental group was significantly higher than that in the control group. This result is consistent with the results of other studies in this field (16,18). Therefore, purposeful and pattern-oriented educational interventions are more efficient and effective in raising students' awareness compared to traditional education which is less effective.

The findings of the current study represented that after educational interference, the mean scores of the HBM constructs in the experimental group increased significantly. These results are in line with the findings of Kabiry et al (16), Karami et al (19), Mazaheri et al (20), and Khani Jeihooni et al (21). All these studies have been based on the HBM.

However, according to the findings of Sohrabivafa et al (22), except for perceived sensitivity, the mean scores of all other constructs of the HBM had a significant increase after the intervention. As reported by Rahimzadeh et al (1), only perceived barriers were significantly different after applying the interventions in the experimental and control groups. This controversy may be attributed to differences in the methods of the provided training, the duration of the training, the small number of training sessions held, and the lack of interest of learners.

Oveisi et al (23) found that perceived self-efficacy, perceived barriers, and perceived sensitivity were the most important predictors of behaviors preventing tooth decay. Given that the perceived threat is an outcome of the integration of perceived sensitivity and perceived severity,

this threat seems to be more effective than other constructs in the adoption of the behavior (24). In fact, people's perception and assessment of risk are the practical axes of the HBM; hence, parents, school teachers, and health educators should promote this important construct as an item shaping behavior (1,24).

Similarly, perceived sensitivity is considered one of the most effective and influential factors in adopting preventive behaviors (23), and real and successful prevention depends on real information about sensitivity and related risks.

As mentioned earlier, self-efficacy is one of the strongest constructs in predicting behavior changes (16,25,26). Adolescent girls who gained a higher level of self-efficacy after educational intervention were successful in practicing brushing and flossing behaviors. This finding conforms to those of other studies (16,27).

In this study, students with a lower level of self-efficacy made fewer efforts to complete favorite performances since they believed that they could not properly accomplish good oral health performances. Therefore, to increase their self-efficacy and sense of empowerment, this group of students was informed about and connected to appropriate role models (students who had a higher level of self-efficacy in performing these behaviors). As a result, these students also made more efforts to increase perceived self-efficacy and perform better and more complete oral health behaviors.

According to the results of the present study and those of the study by Oveisi et al (23), perceived barriers should be reduced to promote the most important behaviors that prevent tooth decay (i.e., brushing and flossing). A noteworthy point about perceived barriers is that when individuals have a weakness in perceiving a risk, perceived barriers increase in turn (18). Hence, efforts were made to reduce or eliminate perceived barriers reported by the students. Among the reported perceived barriers raised in this study, we may mention the time-consuming nature of brushing and flossing, the difficulty of starting a new habit in life, the high cost of good and high-quality toothbrushes and flossing, and severe pain and bleeding in gums. The barriers were greatly reduced through holding a brainstorming session and motivating the students to take part in the discussion and present their own solutions. Based on the results of the present study, the mean scores of perceived severity and perceived benefits in the experimental group increased after the interventions, indicating the effectiveness of educational programs implemented in the form of educational videos and group discussions. These findings are in conformity with those of other studies (15,23).

As one of the limitations of the current study, the data were collected from the target group via self-reports. Perhaps, the use of more objective tools such as observing students' behavior could help achieve a more accurate picture of the number of obtained changes. The short follow-up time (two months after the intervention) was

another limitation of the study. Considering a longer follow-up period to monitor the changes can help assess the achievement of research objectives and the sustainability of these changes in the long run. On the other hand, the present study was conducted on female students in junior high schools. Thus, it seems necessary to take more time to follow up on the interferences and repeat and remind the content of training on a daily basis and assess the durability of training. In addition, it is required to provide pattern-based and targeted training for teachers, health educators, and school officials and involve students' parents, especially their mothers, in training.

Conclusion

The findings indicated the effectiveness of the model-based training program in promoting oral health performances and improving the constructs of the HBM. The more adolescents consider themselves capable of performing oral health related behaviors, the better they will perform the desired behaviors. Students' behaviors increase with an increase in perceived sensitivity and perceived severity. On the other hand, they take more and better care of their mouth and teeth if they believe that observing the principles of oral health, including proper brushing and flossing, can protect them against oral problems and let them feel fresh and healthy; their behaviors are also promoted when they understand that spending time and money to buy toothbrushes and floss and start a new habit is not an obstacle for proper oral health behaviors.

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Conflict of Interests
None declared.

Ethical Permissions
This article is extracted from a research project approved by the Ethics Committee of the Deputy of the Research and Technology of Shahrekord University of Medical Sciences (Ethics code of IR.SKUMS.REC.1395.220).

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